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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,624	07/30/2003	Naoki Shutoh	241072US2SRD	9134

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OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C.  
1940 DUKE STREET  
ALEXANDRIA, VA 22314

EXAMINER
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FICK, ANTHONY D

ART UNIT	PAPER NUMBER
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1753

NOTIFICATION DATE	DELIVERY MODE
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08/28/2007

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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<b>Office Action Summary</b>	<b>Application No.</b> 10/629,624	<b>Applicant(s)</b> SHUTOH ET AL.	
	<b>Examiner</b> Anthony Fick	<b>Art Unit</b> 1753	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 24 May 2007.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 5-16 and 18-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 and 17 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-20 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Priority***

1. Acknowledgment is made of applicant's claim for foreign priority based on applications filed in Japan on November 12, 2002, March 28, 2003 and July 24, 2003. It is noted, however, that applicant has not filed certified copies of the JP 2002-328628, JP 2003-090186, or JP 2003-201294 applications as required by 35 U.S.C. 119(b).

### ***Terminal Disclaimer***

2. Applicant's terminal disclaimer has been filed on May 24, 2007. However the disclaimer has yet to be approved and thus the previous double patenting rejections will be maintained until the office approves the disclaimer.

### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claim 1 is rejected under 35 U.S.C. 102(b) as being anticipated by Sportouch et al. (Thermoelectric Properties of Half-Heusler Phases:  $\text{ErNi}_{1-x}\text{Cu}_x\text{Sb}$ ,  $\text{YNi}_{1-x}\text{Cu}_x\text{Sb}$  and  $\text{Zr}_x\text{Hf}_y\text{Ti}_z\text{NiSn}$ , 18<sup>th</sup> International Conference on Thermoelectrics, 1999, pgs 344-347).

Sportouch et al. disclose thermoelectric materials; specifically compounds that have an MgAgAs type crystal structure, including compounds with the composition formula  $\text{Zr}_x\text{Hf}_y\text{Ti}_z\text{NiSn}$  (abstract).

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Regarding claim 1, Sportouch et al. disclose the use of these compounds as thermoelectric material. Also, Sportouch et al. require the compound to satisfy the condition of  $x+y+z = 1$  (abstract and table 1). Multiplying the compound formulae within table 1 of Sportouch et al. by a factor of 33.33 produces the formula  $(\text{Ti}_z\text{Zr}_x\text{Hf}_y)_{33.33}\text{Ni}_{33.33}\text{Sn}_{33.33}$  with  $0 < z < 1$ ,  $0 < x < 1$ ,  $0 < y < 1$ ,  $z+x+y=1$ , and the x and y variables of the present claim both being equal to 33.33 which is greater than 30 and less than 35. It is the position of the examiner that the claim requirements of "a sintered body" do not further add structure to the material. Thus the material disclosed by Sportouch et al. anticipates the claimed thermoelectric material.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 2 through 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sportouch et al. as applied to claim 1 above, and further in view of Hohl et al. (Efficient dopants for ZrNiSn-based thermoelectric materials, J.Phys.: Condens. Matter, **11**, 1999, pgs 1697-1709).

The disclosure of Sportouch et al. is as stated above for claim 1.

The difference between Sportouch et al. and the claims is the requirement of specific elements replacing some of the elements in the formula.

Hohl et al. teaches efficient dopants for MgAgAs type structure materials.

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Regarding claim 2, Hohl et al. teaches doping by replacing Ti, Zr, or Hf with V, Nb, or Ta (section 3.1.2).

Regarding claim 3, Hohl et al. teaches doping by replacing Ni with Fe, Co and Cu (section 3.1.3).

Regarding claim 4, Hohl et al. teaches doping by replacing Sn with Sb, Bi, Ge, and Pb (section 3.1.4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the doping materials of Hohl et al. with the compound of Sportouch et al. because the doped materials have better thermoelectric properties leading to increased figures of merit over undoped materials. Because Hohl et al. and Sportouch et al. are both concerned with MgAgAs structured thermoelectric materials, one would have a reasonable expectation of success from the combination. Thus the combination meets the claims.

7. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sportouch et al. as applied to claim 1 above, and further in view of Bell (U.S. 6,700,052).

The disclosure of Sportouch et al. is as stated above for claim 1. Sportouch et al. further discloses material is made n type

The difference between Sportouch et al. and claim 17 is the requirement of a thermoelectric element.

Bell teaches a flexible thermoelectric circuit as shown in figure 1B. The thermoelectric element comprises n and p type materials alternatively connected in

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series. Bell further teaches that a variety of thermoelectric materials can be used within the device.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the device of Bell with the thermoelectric material of Sportouch et al. because Bell allows for a multitude of thermoelectric materials to be utilized within the device and the material of Sportouch et al. has improved thermal conductivity over the parent thermoelectric material. Because Sportouch et al. and Bell are both concerned with thermoelectric materials, one would have a reasonable expectation of success from the combination. Thus the combination meets the claim.

8. The previous rejections were based on the interpretation of the claims in which the limitation of "a sintered body" does not add any structural limitations to the claims, and is considered to be a product by process limitation. The following rejections are based upon the interpretation that the structure of a sintered body is different than other structures.

9. Claim 1 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sportouch et al. (Thermoelectric Properties of Half-Heusler Phases:  $\text{ErNi}_{1-x}\text{Cu}_x\text{Sb}$ ,  $\text{YNi}_{1-x}\text{Cu}_x\text{Sb}$  and  $\text{Zr}_x\text{Hf}_y\text{Ti}_z\text{NiSn}$ , 18<sup>th</sup> International Conference on Thermoelectrics, 1999, pgs 344-347) in view of Shen et al. (Synthesis and Sintering of  $\text{ZrNiSn}$  Thermoelectric Compounds, 21<sup>st</sup> International Conference on Thermoelectrics, August 25-29, 2002, pgs 166-169).

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Sportouch et al. disclose thermoelectric materials; specifically compounds that have an MgAgAs type crystal structure, including compounds with the composition formula  $Zr_xHf_yTi_zNiSn$  (abstract).

Regarding claim 1, Sportouch et al. disclose the use of these compounds as thermoelectric material. Also, Sportouch et al. require the compound to satisfy the condition of  $x+y+z = 1$  (abstract and table 1). Multiplying the compound formulae within table 1 of Sportouch et al. by a factor of 33.33 produces the formula  $(Ti_zZr_xHf_y)_{33.33}Ni_{33.33}Sn_{33.33}$  with  $0 < z < 1$ ,  $0 < x < 1$ ,  $0 < y < 1$ ,  $z+x+y=1$ , and the x and y variables of the present claim both being equal to 33.33 which is greater than 30 and less than 35.

The difference between Sportouch et al. and the claim is the requirement of a sintered body.

Shen et al. teach a process of preparing thermoelectric compounds by sintering instead of the commonly used arc melting method (abstract). The compounds are ZrNiSn based half-Heusler compounds with the MgAgAs type crystal structure (introduction).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the sintering method of Shen et al. to create the half-Heusler compound of Sportouch et al. because the sintering method creates dense compounds with fine grain size and homogenous microstructure (Shen et al. abstract). Because Shen et al. and Sportouch et al. are concerned with creating half-Heusler, ZrNiSn based thermoelectric compounds with MgAgAs type crystal structure, one would

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have a reasonable expectation of success from the combination. Thus the combination meets claim 1.

10. Claims 2 through 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sportouch et al. in view of Shen et al. as applied to claim 1 above, and further in view of Hohl et al. (Efficient dopants for ZrNiSn-based thermoelectric materials, J.Phys.: Condens. Matter, **11**, 1999, pgs 1697-1709).

The disclosure of Sportouch et al. in view of Shen et al. is as stated above for claim 1.

The difference between Sportouch et al. in view of Shen et al. and the claims is the requirement of specific elements replacing some of the elements in the formula.

Hohl et al. teaches efficient dopants for MgAgAs type structure materials.

Regarding claim 2, Hohl et al. teaches doping by replacing Ti, Zr, or Hf with V, Nb, or Ta (section 3.1.2).

Regarding claim 3, Hohl et al. teaches doping by replacing Ni with Fe, Co and Cu (section 3.1.3).

Regarding claim 4, Hohl et al. teaches doping by replacing Sn with Sb, Bi, Ge, and Pb (section 3.1.4).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the doping materials of Hohl et al. with the compound of Sportouch et al. in view of Shen et al. because the doped materials have better thermoelectric properties leading to increased figures of merit over undoped materials. Because Hohl et al. and Sportouch et al. in view of Shen et al. are concerned with

MgAgAs structured thermoelectric materials, one would have a reasonable expectation of success from the combination. Thus the combination meets the claims.

11. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sportouch et al. in view of Shen et al. as applied to claim 1 above, and further in view of Bell (U.S. 6,700,052).

The disclosure of Sportouch et al. in view of Shen et al. is as stated above for claim 1. Sportouch et al. further discloses material is made n type

The difference between Sportouch et al. in view of Shen et al. and claim 17 is the requirement of a thermoelectric element.

Bell teaches a flexible thermoelectric circuit as shown in figure 1B. The thermoelectric element comprises n and p type materials alternatively connected in series. Bell further teaches that a variety of thermoelectric materials can be used within the device.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize the device of Bell with the thermoelectric material of Sportouch et al. in view of Shen et al. because Bell allows for a multitude of thermoelectric materials to be utilized within the device and the material of Sportouch et al. in view of Shen et al. has improved thermal conductivity over the parent thermoelectric material. Because Sportouch et al. in view of Shen et al. and Bell are concerned with thermoelectric materials, one would have a reasonable expectation of success from the combination. Thus the combination meets the claim.

### ***Double Patenting***

12. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

13. Claims 1-4 and 17 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of copending Application No. 11/088,245. Although the conflicting claims are not identical, they are not patentably distinct from each other because the copending claims meet the requirements of the present claimed compound.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

### ***Response to Arguments***

14. Applicant's arguments filed May 24, 2007 have been fully considered but they are not persuasive. Applicant argues that the claim limitation of "a sintered body"

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overcomes the reference to Sportouch et al. and thus the claims are allowable. The examiner respectfully disagrees. As stated above, this limitation is given two different interpretations by the examiner. First, the limitation is interpreted as a process limitation that does not further alter the composition or structure of the material. Therefore the reference to Sportouch et al. discloses the same composition as required by the claims and the method of producing the composition is not relevant. Thus the previous rejections are maintained. The second interpretation is that the method of making the compound does alter the structure and is relevant to the claim. The new grounds of rejection are given above for this interpretation. These new grounds were required by applicant's amendments to the claims. As applicant's arguments are directed toward the old rejections, the arguments are moot for these new grounds of rejection.

### ***Conclusion***

15. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Fick whose telephone number is (571) 272-6393. The examiner can normally be reached on Monday - Friday 7 AM to 4 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (571) 272-1342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Anthony Fick *ADF*  
AU 1753  
August 16, 2007

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